Claims

We Claim:

1. A method for preparing asphalt and polymer compositions comprising:
heating a mixture of asphalt and an elastomeric polymer; and
adding a metal salt in excess of amounts of an organic or inorganic metal salt used as an activator, where the metal of the metal salt is selected from the group consisting of zinc, cadmium, mercury, copper, silver, nickel, platinum, iron, magnesium, and mixtures thereof.

2. The method of claim 1 where the metal salt is a metal oxide is added in an amount (up to 5 wt%) at least about 10 times more than that used when the metal oxide is used as an activator (up to 0.2 wt%), based on the weight of the asphalt/polymer mixture.

3. The method of claim 1 where the metal salt is a metal oxide selected from the group consisting of zinc oxide, calcium oxide and combinations thereof.

4. The method of claim 3 where the metal oxide is zinc oxide and the zinc oxide is added in an amount ranging from about 0.05 to about 5 wt% based on the mixture.

5. The method of claim 1 where the compatibility of the asphalt and polymer composition is improved as compared with the compatibility of an identical asphalt and polymer composition having a metal salt amount normally used as an activator.

6. The method of claim 1 further comprising adding a crosslinker to the mixture, where the crosslinker is selected from the group consisting of a sulfur-containing derivative and elemental sulfur and mixtures thereof.

7. The method of claim 6 where in adding the crosslinker, the crosslinker is selected from the group consisting of elemental sulfur, mercaptobenzothiazole (MBT), thiurams, dithiocarbamates, mercaptobenzimidazole, and mixtures thereof.

8. The method of claim 6 where the metal salt proportion is at least about five times greater than the crosslinker proportion.

9. The method of claim 6 where the crosslinker is present in an amount ranging from about 0.01 to 0.4 wt%, based on the weight of the asphalt/polymer mixture.

10. The method of claim 1 further comprising adding ground tire rubber (GTR) to the mixture of asphalt and an elastomeric polymer.

11. The method of claim 10 where the amount of GTR ranges from about 1 to about 20 wt% of the mixture.

12. The method of claim 11 where the metal salt is zinc oxide and the zinc oxide is added in an amount at least about 8 times more than that used as an activator.

13. The method of claim 10 where the GTR and mixture of asphalt and an elastomeric polymer is more homogeneous as compared to an identical mixture

of GTR, asphalt and elastomeric polymer having an amount of metal salt when the metal oxide is used as an activator.

14. The method of claim 1 where the asphalt and polymer compositions have reduced gel.

15. A method of road building comprising combining the asphalt and polymer composition made by the method of claim 1 with an aggregate to form a road paving material, and using the material to form road pavement.

16. A method of sealing a roof comprising heating the asphalt and polymer composition made by the method of claim 1 and distributing it over at least a portion of a roof surface.

17. A method for preparing asphalt and polymer compositions comprising:
heating a mixture of asphalt and an elastomeric polymer; and
adding a metal oxide in excess of amounts of metal oxide used as an activator, where the metal oxide is selected from the group consisting of zinc oxide, iron oxide, copper oxide, magnesium oxide calcium oxide and combinations thereof, and where the metal oxide is added in an amount at least 10 times (up to 5 wt %) more than that normally used (up to 0.1 wt %) based on the weight of the asphalt/polymer mixture;
where the compatibility of the asphalt and polymer composition is improved as compared with the compatibility of an identical asphalt and polymer composition having a metal oxide amount used when the metal oxide is used as an activator.

18. The method of claim 17 where the metal oxide is zinc oxide and the zinc oxide is added in an amount ranging from about 0.05 to about 2 wt.% based on the mixture.

19. The method of claim 17 further comprising adding a crosslinker to the mixture, where the crosslinker is selected from the group consisting of a sulfur-containing derivative and elemental sulfur and mixtures thereof.

20. The method of claim 19 where in adding the crosslinker, the crosslinker is selected from the group consisting of elemental sulfur, mercaptobenzothiazole (MBT), thiurams, dithiocarbamates, mercaptobenzimidazole, and mixtures thereof.

21. The method of claim 19 where the metal oxide proportion is at least about five times greater than the crosslinker proportion.

22. The method of claim 19 where the crosslinker is present in an amount ranging from about 0.01 to 0.4 wt%, based on the weight of the asphalt/polymer mixture.

23. A method for preparing asphalt and polymer compositions comprising:
heating a mixture of asphalt and an elastomeric polymer;
adding a metal oxide in excess of amounts of metal oxide used as an activator, where the metal of the metal oxide is selected from Groups IIA and IIB of the Periodic Table (CAS notation); and
adding ground tire rubber (GTR) to the mixture of asphalt and an elastomeric polymer before or after the metal oxide is added;
where the GTR and mixture of asphalt and an elastomeric polymer is more homogeneous as compared to an identical mixture of GTR, asphalt and

elastomeric polymer having an amount of metal oxide when the metal oxide is used as an activator.

24. The method of claim 23 where the amount of GTR ranges from about 1 to about 20 wt% of the mixture.

25. The method of claim 23 where the metal oxide is zinc oxide and the zinc oxide is added in an amount at least about 8 times more than that used as an activator based on the weight of the asphalt/polymer mixture.

26. A polymer modified asphalt (PMA) comprising:
an asphalt;
an elastomeric polymer; and
an organic or inorganic metal salt present in an amount in excess of an amount of metal salt used as an activator, where the metal of the metal oxide is selected from the group consisting of zinc, cadmium, mercury, copper, silver, nickel, platinum, iron, magnesium, and mixtures thereof.

27. The PMA of claim 26 where the metal salt is present in an amount (up to 5 wt%) at least about 10 times more than that used when the metal salt is used as an activator (up to 0.2 wt%), based on the weight of the asphalt/polymer mixture.

28. The PMA of claim 26 where the metal salt is a metal oxide selected from the group consisting of zinc oxide, calcium oxide and combinations thereof.

29. The PMA of claim 28 where the metal salt is zinc oxide and the zinc oxide is added in an amount ranging from about 0.05 to about 5 wt.% based on the combined amount of asphalt and elastomeric polymer.

30. The PMA of claim 26 where the compatibility of the PMA is improved as compared with the compatibility of an identical PMA having a metal salt amount normally used as an activator.

31. The PMA of claim 26 further comprising a crosslinker, where the crosslinker is selected from the group consisting of a sulfur-containing derivative and elemental sulfur and mixtures thereof.

32. The PMA of claim 31 where the crosslinker is selected from the group consisting of elemental sulfur, mercaptobenzothiazole (MBT), thiurams, dithiocarbamates, mercaptobenzimidazole, and mixtures thereof.

33. The PMA of claim 31 where the metal salt proportion is at least about five times greater than the crosslinker proportion.

34. The PMA of claim 31 where the crosslinker is present in an amount ranging from about 0.01 to 0.1 wt%, based on the weight of the asphalt/polymer mixture.

35. The PMA of claim 26 further comprising ground tire rubber (GTR).

36. The PMA of claim 35 where the amount of GTR ranges from about 1 to about 20 wt% of the PMA.

37. The PMA of claim 35 where the metal salt is zinc oxide and the zinc oxide is added in an amount at least about 8 times more than that used as an activator.

39. The PMA of claim 35 where the mixture of GTR and PMA is more homogeneous as compared to an identical mixture of GTR and PMA having an amount of metal salt when the metal salt is used as an activator.

40. The PMA of claim 26 where the PMA has reduced gel.

41. A road made from the PMA of claim 26 and aggregate.

42. A roof sealed with the PMA of claim 26.

43. A polymer modified asphalt (PMA) comprising:
asphalt;
an elastomeric polymer; and
a metal oxide present in an amount at least 10 times (up to 5 wt%) more than that used as an activator (up to 0.1 wt %), where the metal oxide is selected from the group consisting of zinc oxide, calcium oxide and combinations thereof;
where the compatibility of the asphalt and polymer composition is improved as compared with the compatibility of an identical asphalt and polymer composition having a metal oxide amount used when the metal oxide is used as an activator.

44. The PMA of claim 43 where the metal oxide is zinc oxide and the zinc oxide is present in an amount ranging from about 0.05 to about 2 wt.% based on the combined amount of asphalt and elastomeric polymer.

45. The PMA of claim 43 further comprising a crosslinker, where the crosslinker is selected from the group consisting of a sulfur-containing derivative and elemental sulfur and mixtures thereof.

46. The PMA of claim 45 where the crosslinker is selected from the group consisting of elemental sulfur, mercaptobenzothiazole (MBT), thiurams, dithiocarbamates, mercaptobenzimidazole, and mixtures thereof.

47. The PMA of claim 45 where the metal oxide proportion is at least about five times greater than the crosslinker proportion.

48. The PMA of claim 45 where the crosslinker is present in an amount ranging from about 0.01 to 0.1 wt%, based on the combined amount of asphalt and elastomeric polymer.

49. A polymer modified asphalt (PMA) comprising:

a mixture of asphalt and an elastomeric polymer;

a metal oxide present in an amount in excess of an amount of metal oxide used as an activator, where the metal of the metal oxide is selected from Groups IIA and IIB of the Periodic Table (CAS notation); and

ground tire rubber (GTR);

where the GTR and mixture of asphalt and an elastomeric polymer is more homogeneous as compared to an identical mixture of GTR, asphalt and elastomeric polymer having an amount of metal oxide when the metal oxide is used as an activator.

50. The PMA of claim 49 where the amount of GTR ranges from about 1 to about 20 wt% of the mixture.

51. The PMA of claim 49 where the metal oxide is zinc oxide and the zinc oxide is added in an amount at least about 8 times more than that used as an activator.